Claims

1. A traffic information providing method which performs discrete wavelet transform on traffic information represented by a function of distance from a reference position on a road to convert the traffic information to scaling coefficients and wavelet coefficients, and provides the resulting information.

2. The traffic information providing method according to claim 1, characterized by generating sampling data based on the traffic information represented by the function of distance from the reference position and performing discrete wavelet transform on the sampling data.

3. A traffic information providing method which performs discrete wavelet transform on traffic information represented by a function of time to convert the traffic information to scaling coefficients and wavelet coefficients, and provides the resulting information.

4. The traffic information providing method according to claim 3, characterized by using the traffic information sampled at a fixed time pitch as sampling data and performing discrete wavelet transform on the sampling data.

5. The traffic information providing method according to claim 2 or 4, characterized by performing one or more discrete wavelet transform processes on the sampling data.

6. The traffic information providing method according to any one of claims 1 through 5, characterized by providing the scaling coefficients earlier than the wavelet coefficients, and providing, among the wavelet coefficients, high-order wavelet coefficients earlier than low-order wavelet coefficients.

7. The traffic information providing method according to any one of claims 1 through 6, characterized by performing bit plane decomposition on the scaling coefficients and wavelet coefficients and providing the resulting coefficients.

8. The traffic information providing method according to claim 7,

characterized by appending copyright information to the low-order bits of the scaling coefficients or wavelet coefficients and providing the resulting coefficients.

9. The traffic information providing method according to claim 7, characterized by encrypting part of the bit planes of the bit-plane decomposed scaling coefficients and wavelet coefficients and providing the resulting coefficients.

10. A traffic information providing system comprising:

a traffic information providing apparatus for generating sampling data from traffic information represented by a function of distance from a reference position on a road, performing one or more discrete wavelet transform processes on the sampling data to convert the traffic information to scaling coefficients and wavelet coefficients, and providing the coefficients; and

a traffic information utilization apparatus for performing one or more inverse discrete wavelet transform processes on the scaling coefficients and wavelet coefficients received from the traffic information providing apparatus to restore the traffic information.

11. A traffic information providing system comprising:

a traffic information providing apparatus for using traffic information measured at a fixed time pitch as sampling data, performing one or more discrete wavelet transform processes on the sampling data to convert the traffic information to scaling coefficients and wavelet coefficients, and providing the coefficients; and

a traffic information utilization apparatus for performing one or more inverse discrete wavelet transform processes on the scaling coefficients and wavelet coefficients received from the traffic information providing apparatus to restore the traffic information.

12. The traffic information providing system according to claim 10 or 11, characterized in that the traffic information providing apparatus provides the scaling coefficients earlier than the wavelet coefficients and provides, among the wavelet coefficients, high-order wavelet coefficients earlier than low-order wavelet coefficients and the traffic information utilization apparatus performs

inverse discrete wavelet transform on the scaling coefficients and the received wavelet coefficients to restore the traffic information.

13. The traffic information providing system according to claim 12, characterized in that the traffic information providing apparatus performs bit plane decomposition on the scaling coefficients and wavelet coefficients and provides the coefficients and the traffic information utilization apparatus starts to restore the traffic information on receiving the bit information of part of the bit-plane-decomposed scaling coefficients and wavelet coefficients.

14. The traffic information providing system according to claim 10 or 11, characterized in that the traffic information providing apparatus performs bit plane decomposition on the scaling coefficients and wavelet coefficients, appends copyright information to the low-order bits of the scaling coefficients or wavelet coefficients, and provides the coefficients, and the traffic information utilization apparatus deletes the copyright information appended to the scaling coefficients or wavelet coefficients and performs the inverse discrete wavelet transform.

15. The traffic information providing system according to claim 10 or 11, characterized in that the traffic information providing apparatus performs bit plane decomposition on the scaling coefficients and wavelet coefficients, encrypts some of the bit planes of the scaling coefficients or wavelet coefficients, and provides the coefficients and that the traffic information utilization apparatus decodes the encrypted scaling coefficients or wavelet coefficients and performs the inverse discrete wavelet transform.

16. A traffic information providing apparatus comprising:

traffic information conversion means for generating sampling data from the collected traffic information data;

traffic information encoding means for performing one or more discrete wavelet transform processes on the sampling data to convert the traffic information to scaling coefficients and wavelet coefficients; and

traffic information transmission means for transmitting the scaling coefficients earlier than the wavelet coefficients and transmitting, among the wavelet coefficients, high-order wavelet coefficients earlier than low-order

wavelet coefficients.

17. Traffic information utilization apparatus comprising:

traffic information reception means for receiving from a traffic information providing apparatus road section reference data representing a target road of traffic information and scaling coefficients and wavelet coefficients as traffic information;

target road determination means for identifying the target road of the traffic information by using the road section reference data; and

traffic information decoding means for performing one or more inverse discrete wavelet transform processes on the scaling coefficients and wavelet coefficients in order to restore the traffic information.

18. A traffic information providing method characterized by performing discrete wavelet transform on a reciprocal of speed information represented by a function of distance from a reference position on a road to convert the reciprocal of the speed information to scaling coefficients and wavelet coefficients and providing the coefficients.

19. The traffic information providing method according to claim 18, characterized by generating 2^N sampling data items or a multiple of the 2^N sampling data items from the speed information represented by the function of distance from the reference position and performing discrete wavelet transform on the reciprocal of the sampling data.

20. The traffic information providing method according to claim 18, characterized by multiplying the reciprocal of the sampling data by a constant, performing discrete wavelet transform on the reciprocal multiplied by the constant to convert the inverses to scaling coefficients and wavelet coefficients, converting the scaling coefficients and wavelet coefficients to integers and providing the integers.

21. The traffic information providing method according to claim 20, characterized by switching magnitude of the constant in response to a speed limit of the target road or average vehicle travel speed.

22. The traffic information providing method according to claim 3, characterized by performing one or more to N discrete wavelet transform processes on the reciprocal multiplied by the constant.

23. The traffic information providing method according to any one of claims 1 through 22, characterized by processing the wavelet coefficients having absolute values equal to or below a predetermined value as values of 0 and provides the coefficients.

24. The traffic information providing method according to any one of claims 18 through 23, characterized by providing the scaling coefficients earlier than the wavelet coefficients and providing, among the wavelet coefficients, high-order wavelet coefficients earlier than low-order wavelet coefficients.

25. A traffic information providing system comprising:

traffic information providing apparatus for generating sampling data from speed information represented by a function of distance from a reference position on a road, performing one or more discrete wavelet transform processes on the reciprocal of the sampling data to convert the reciprocal of the speed information to scaling coefficients and wavelet coefficients, and providing the coefficients; and

traffic information utilization apparatus for performing one or more inverse discrete wavelet transform processes on the scaling coefficients and wavelet coefficients received from the traffic information providing apparatus, converting the obtained value to its reciprocal, and restoring the speed information.

26. The traffic information providing system according to claim 25, characterized in that the traffic information providing apparatus multiplies the reciprocals of the sampling data by a constant, performs inverse wavelet transform on the reciprocals multiplied by the constant to convert the reciprocals to scaling coefficients and wavelet coefficients, converts the scaling coefficients and wavelet coefficients to integers and provides the integers to the traffic information utilization apparatus and the traffic information utilization apparatus performs inverse discrete wavelet transform on the scaling

coefficients and wavelet coefficients, multiplies the reciprocal of an obtained value by the constant, and restores the speed information.

27. The traffic information providing system according to claim 25 or 26, characterized in that the traffic information providing apparatus provides the scaling coefficients earlier than the wavelet coefficients and provides, among the wavelet coefficients, high-order wavelet coefficients earlier than low-order wavelet coefficients and the traffic information utilization apparatus performs inverse discrete wavelet transform on the scaling coefficients and the received wavelet coefficients, converts an obtained value to a reciprocal and restores the speed information.

28. The traffic information providing system according to claim 27, characterized in that the traffic information providing apparatus switches magnitude of the constant in response to a speed limit of the target road or average vehicle travel speed.

29. The traffic information providing system according to any one of claims 25 through 28, characterized in that the traffic information providing apparatus processes the wavelet coefficients having absolute values equal to or below a predetermined value as values of 0 and provides the coefficients.

30. A traffic information providing apparatus comprising:

traffic information conversion means for generating 2^N sampling data items or a multiple of the 2^N sampling data items from collected speed information data;

traffic information encoding means for performing one or more discrete wavelet transform processes on reciprocals of the sampling data to convert the reciprocals to scaling coefficients and wavelet coefficients; and

traffic information transmission means for transmitting the scaling coefficients earlier than the wavelet coefficients and transmitting, among the wavelet coefficients, high-order wavelet coefficients earlier than low-order wavelet coefficients.

31. A traffic information utilization apparatus comprising:

traffic information reception means for receiving from a traffic

information providing apparatus a road section reference data representing a target road of traffic information and scaling coefficients and wavelet coefficients as traffic information;

target road determination means for identifying the target road of the traffic information by using the road section reference data; and

traffic information decoding means for performing one or more inverse discrete wavelet transform processes on the scaling coefficients and wavelet coefficients, converting an obtained value to reciprocals, and restoring the speed information.